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AUTHOR Sorensen, Elsebeth Korsgaard; Tolsby, Haakon; Dirckinck-Holmfeld, Lone

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## ABSTRACT

This paper addresses the problems of collaboration in distributed Web-based learning. It reviews, treats and discusses these problems from the learning theoretical perspective of "communities of practice" as presented by Etienne Wenger (1998), with reference to past and future Web-based designs. The paper suggests the concept and design of virtual portfolio as a pedagogical tool to be implemented in the virtual environment for the enhancement of distributed collaboration in Web-based learning. Includes three figures. (Contains 14 references.) (Author)

# Virtual Portfolios for Collaboration in Distributed Web-Based Learning

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Elsebeth Korsgaard Sorensen  
Dept. of Communication, Aalborg University, Denmark  
[eks@hum.auc.dk](mailto:eks@hum.auc.dk)

Haakon Tolsby  
Dept. of Communication, Aalborg University, Denmark  
[hakont@hum.auc.dk](mailto:hakont@hum.auc.dk)

Lone Dirckinck-Holmfeld  
Dept. of Communication, Aalborg University, Denmark  
[lone@hum.auc.dk](mailto:lone@hum.auc.dk)

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**Abstract:** This paper addresses the problems of collaboration in distributed web-based learning. It reviews, treats and discusses these problems from the learning theoretical perspective of "communities of practice" as presented by Etienne Wenger (1998), with reference to past and future web-based designs. The paper suggests the concept and design of virtual portfolio as a pedagogical tool to be implemented in the virtual environment for the enhancement of distributed collaboration in web-based learning.

## Introduction

It is widely accepted that web-based learning environments, on the one hand, offer promising and qualitative potential for distributed CSCL (Computer Supported Collaborative Learning). It is, however, equally shared that they present us with complex challenges in terms of student engagement, interaction, and collaboration. The problems of engagement and interaction in collaborative processes in distributed Web-based learning appear to be recurring phenomena, often stated by the literature (Kaye 1992; Mason 1993; Sorensen 1997; Dirckinck-Holmfeld 1990; Fjuk 1998). It seems to be a stubborn feature in the delivery of distributed CSCL on the web that collaborative initiatives and processes – in their broadest sense – have a hard time coming into existence (Sorensen 1997).

The searching for reasons to these problems and ways of solving them have produced a variety of foci and initiatives, all of which are resting on different assumptions. The role and communicative behavior of the instructor as a unit of analysis has received a considerable amount of attention, based on the assumption that the teacher's behavior in the virtual learning process to a large degree is responsible for a lacking engagement and interaction among students (Davie 1989; Feenberg 1989). Another concern has addressed the nature of the collaborative activities implemented in the learning process, based on the assumption that a main reason for lacking interaction and collaboration most likely were to be found in the way the distributed collaborative tasks and activities were designed (Collis 1996). There is no doubt that both of these research perspectives deal with very pertinent aspects of virtual learning designs and deliveries, but it is equally unlikely that they constitute the whole story, so to speak. What characterizes these perspectives, however, is that both assume the main cause of the problem concerning interaction and collaboration to be situated in the instructional and pedagogical aspects of the learning process. There are alternative studies concerned with the nature and quality of the virtual environment and its ability to support collaboration. One illustration of this is the design of the Virtual-U environment, which can be viewed as a result of design efforts especially directed towards facilitating and scaffolding collaborative interaction in web-based learning (Sorensen 1999). Other perspectives concerned with collaboration, e.g. as a broader concept than linguistic interactions, most often are to be found among software designers, developing shared tools like e.g. shared documents or shared whiteboards to facilitate "tangible" (non-verbal) collaborative (inter)actions in web-based learning.

Discussions around collaborative learning designs often mirror the latent perspective that collaborative learning is more or less synonymous to collaborative (linguistic) interactions. Only few studies seem to address, both the linguistic interaction and the non-linguistic collaboration among students as two sides of the same coin. This paper argues that linguistic interaction and the more tangible carrying-out part of the interaction cannot be separated from each other. We must build shared communities of practice, shared frameworks, and shared histories in order to support distributed CSCL.

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This paper presents the hypothesis, that implementing a shared virtual (group) portfolio, in which linguistic and non-linguistic collaboration among students are combined and situated in time and space, will support student engagement, interaction and collaboration and, thus, enhance genuine collaborative learning (Wenger 1998; Salomon 1995; Sorensen 1999). Structures and frames for managing shared experiences and shared histories must be built into a virtual learning environment if engagement, sharedness and collaboration in learning are to flourish and unfold. The implemented virtual portfolio structures from two web-based courses constitute the investigated data. In one of the courses attempts were made to provide structures to support especially the linguistic interactive part of the group collaboration and engagement. In the other course, it was the non-verbal part of the group collaboration that received the structural support. Section 2 of the paper briefly introduces the special conditions of a web-based learning process using some central concepts from the theoretical perspective of "Communities of Practice. Learning, Meaning, and Identity" (Wenger 1998). Section 3 provides a review of potentials of using the virtual portfolio concept. While section 4 provides a discussion of two different types of virtual portfolio (VP) for collaboration, section 5 forms the forum for our conclusions and future perspectives.

## Distributed CSCL as Virtual Communities of Practice

Collaborative learning between students is widely recognized as a fruitful way of learning. It is through collaboration that negotiation of perspectives between peers takes place, a process through which students reconsider and reflect on the perspectives of their fellow students and accommodate those to their own knowledge and beliefs (Fjuk & Dirckinck-Holmfeld 1997). Collaboration in learning creates a positive commitment that motivates participation and drives the learning process (Illeris 1981). But collaboration is not something that can easily be implemented in a learning situation. As argued by Salomon, collaborative learning demands that the whole learning environment being designed as an orchestrated whole (Salomon 1995), meaning that all the entities and processes in the learning environment (including curriculum, activities, and roles) must be taken into account. Salomon argues that the design of the technology itself is the least important factor in facilitation of distributed CSCL and that computers alone are not likely to produce a genuine interdependency that creates need for sharing, for joint endeavor and for a pooling together of minds (Salomon 1995).

In principle, we share Salomon's view. Nonetheless, one should not eliminate the role of technology, especially in the context of distributed CSCL, as there are reasons to assume that the less people meet face to face, the more dependent they become of computer tools and their quality in order to succeed in collaboration. The establishment of interdependency between peers, which (according to Salomon) is a fundament for collaboration, is also dependent on the availability of appropriate tools. Virtual collaboration gets established through technological tools allowing minds to focus on the same problem. This means that the medium, on the one hand, enables a group of people to communicate, and on the one hand, allows them to carry out non-verbal collaborative actions and produce shared reifications during their collaborative work process. These tools are important for collaboration in general, but for distributed CSCL they are essential.

The design of these tools demands an understanding of how people learn in social contexts. For that purpose we turn to Etienne Wenger and his concept of "communities of practice" in which he conceptualizes a social theory of learning (Wenger 1998). According to Wenger the core of social learning is the continuous negotiation of meaning between participants in a practice. This negotiation process is an inseparable part of practice. If there is no negotiation of meaning, there is no practice to be part of. The negotiation of meaning is an intricate process. It is not limited to linguistic behavior. It also includes our social non-verbal interactions and relations. Wenger explains the negotiation of meaning as involving two constituent processes: *participation* and *reification*. These two processes exist in duality, affecting each other and being the source of development to each other:

I will use the term participation to describe the social experience of living in the world in terms of membership in social communities and active involvement in social enterprises. Participation in this sense is both personal and social. It is a complex process that combines doing, talking, thinking, feeling, and belonging. It involves our whole person including our bodies, minds emotions, and social relations (Wenger, 1998, p. 56)

Reification ... refers to the process of giving form to our experience by producing objects that congeal this experience into "thingness" ... Reification can refer to both to a process and its product (Wenger, 1998, p. 58)

But since production of meaning is distributed across reification and participation, a dynamic relationship between the two must be established in our design and facilitation of learning. If not, the negotiation and construction of meaning may become problematic.

If participation prevails – if most of what matters is left unreified then there may not be enough material to anchor the specificities of coordination and to uncover diverging assumptions.(...) If reification prevails – if everything is reified, but with little opportunity for shared experience and interactive negotiation – then there may not be enough overlap in participation to recover a coordinated, relevant, or generative meaning (Wenger, 1998, p. 65)

In a community of practice the reificative and participatory aspects form what Wenger denotes as a *shared repertoire*. A shared repertoire is the fundamental resource for negotiating of meaning in a community. It is a product of a community of practice over time, including routines, words, tools, ways of doing things, stories, gestures, symbols, genres, actions or concepts that the community has produced or adopted in the course of its existence, and which have become part of its practice. Viewing CSCL as a virtual *community of practice*, a challenge for design is to apply technological tools that constitute a *shared repertoire*. The shared repertoire (the duality between participation and reification) is open and directly available for negotiation in face-to-face learning communities. But in a distributed, symbolic, asynchronous virtuality, which is fundamentally established through technology, the processes of both participation and reification must be built into the technological tools.

In our view, the lack of shared repertoire is one of the most serious shortcomings of most CSCL environments. Later in this paper we suggest the virtual portfolio as a promising concept for visualizing the shared repertoire. The virtual portfolio is interesting and valuable because it makes explicit, both the negotiation (i.e. the participatory aspects) and reification of meaning

## Virtual portfolios – Up Until Now

Portfolio has become a popular educational tool. It is being used in courses reaching from basic to higher education (Niguidula 1993; Leeman 1997/98), and it has been adopted as a tool for professional development and lifelong learning (Tenhula 1996). Historically, the portfolio concept has developed from artistic professions (e.g. architects, designers, models, etc.). In artistic contexts portfolios are used as collectors of the products of the artists. Likewise, a student portfolio is a purposeful collection of samples documenting the work of a student, exhibiting quality and progress.

From a pedagogical point of view there are two basic reasons for using portfolios (Arter 1995). It is a powerful tool for assessment, and it is a supporting tool for structuring and giving momentum to the learning trajectory. In any case, both of these aspects are meaningless to separate, since they appear to be two sides of the same coin. Our motivation for using virtual portfolios (VP's) in design of distributed CSCL is their potential for structuring the learning trajectory in a way that highlights learning as a constructivist, experiential, reflective and social matter. As the concept of VP is a very open concept, many of the constructivist approaches and netbased learning environments are included. VPs provide useful frameworks for discussing and designing student centered learning environments on the net.

### Advantages of using virtual portfolios

From the presented perspective of learning as a phenomenon, taking place socially through negotiation of meaning between participants in communities of practice, VP's represent the following attractive potential for supporting learning:

- VP is activity oriented, as activities aiming at fulfilling learning goals may be implemented
- VP may support student-centeredness, if the VP is owned and controlled by the student
- The student may be involved in the assessment process, as the VP supports self-reflection as a learning activity. By letting students assess their own progress, students become shareholders of their own destiny, so to speak (Sorensen & Takle 1999)
- Assessment can be based on samples demonstrating authentic work focusing on the student as a problem solver
- By focusing at different entities during a time period, VP's make it possible to observe individual student progression (Sorensen & Takle 1999)
- VP's are artifacts especially suited for reification of meaning. They provide the learner with a "picture" of the accumulated experiences and process of development. Meaning is created, reified through visualization, and laid open for individual and collaborative reflection
- VP's provide views and structure to the future learning process by prescribing activities ahead. It can visualize participation as history but also as future events. Structuring within course parts helps to maintain a more detailed, structured overview of course elements and supports the cognitive processes of perception,

categorization, classification, recognition, and integration of details of a theme or phenomenon into a whole (Sorensen 1996).

Nevertheless, implementing VP's do not automatically guaranty successful learning. As default, a VP provides a structure of a process over time, but the quality of the VP for supporting collaborative learning in online communities of practice is entirely dependent on the pedagogical perspective and techniques that get implemented in the VP (Sorensen & Takle 2001).

#### Disadvantages of using virtual portfolio

VP's also have some fundamental limitations:

- VP's are, traditionally viewed, individual tools. The focus is on the individual learner as a constructor of knowledge. One may argue that publishing a virtual portfolio on the Web will enhance collaboration, but it does not happen automatically that sharing of knowledge provides collaboration. If we want VP owners to get engaged in each other's work, we must design for that to be a VP activity.
- There is only a minor distance from supporting to controlling the learner. VP's contain the potential of being tools for control and surveillance. VP's may be used for controlling what the student should learn, and how he should learn. An instrumental pedagogical approach may be implemented in which the VP activities are shaped as tasks with predefined answers, instead of problems to be solved. Viewed from such a perspective, there is some risk that the portfolio may be a tool for reproduction of knowledge, instead of a tool for supporting democratic learning, marked by ownership, personal engagement and lack of authoritative power mechanisms.

### Two Different Types of Virtual Portfolio for Collaboration

In order to illustrate the relation between participation and reification and their significance in design of a virtual community, which supports collaboration, we present two different implementations of VP's, both inspired by the portfolio idea. The first example is an implementation that strongly supports participation, but support for reification of meaning is limited by the environment. The second example is designed with reification as the primary goal. In this case, students are using portfolios for constructing their individual curriculum, but not seeking participation and knowledge construction in a social practice.

#### Participation but limited reification

The first example of a VP is provided by a one-year distance education course on how to employ ICT in learning, offered at Aalborg University in Denmark. The course was delivered mainly as distributed CSCL and attracted 36 participants from all over Denmark. The main part of the course was carried out over the Web, using the virtual learning environment, Virtual-U. An additional four face-to-face seminars were held during this one-year period. Project-based group work constituted the main activity of the course. The supervision of the project work took place, both at the face-to-face seminars, but mainly asynchronously in the Virtual-U environment. In the problem-based project work, the students specialized in a particular area within the main subject. They departed from a research problem that they themselves identified and formulated, a problem that was related to their concrete daily work and work interests. The problem of their project work was elucidated through study of relevant literature and different types of data collection within the problem area.

The students were provided with a communicative forum as the collaborative space for their project work. No other structuring "environmental" facilities were offered. As argued above, a virtual environment is not necessarily a rich environment, and in order to get more overview and meaning out of their dialog the students were encouraged to create sub-conferences as their need arose (Fig. 1).







- |     |   |  |
|-----|---|--|
| 8.  |  | HumInf:GruppeKonferencer:ProjektGruppe_2 (0 new of 131)                    |
| 9.  |  | HumInf:GruppeKonferencer:ProjektGruppe_2:Litteratur (0 new of 131)         |
| 10. |  | HumInf:GruppeKonferencer:ProjektGruppe_2:Meddelelser (0 new of 451)        |
| 11. |  | HumInf:GruppeKonferencer:ProjektGruppe_2:ProjektVeiledning_2 (0 new of 21) |
| 12. |  | HumInf:GruppeKonferencer:ProjektGruppe_2:Projektstyr (0 new of 93)         |
| 13. |  | HumInf:GruppeKonferencer:ProjektGruppe_2:case (0 new of 39)                |

Figure 1: The VP structured by means of conferences (were used)



Although the names in figure 1 are all in Danish, it is clear that project group 2 created five sub-conferences: one for literature, one for announcements, one for project guidance, one for project steering, and one for discussing cases. Sub-conferencing may be attractive for structuring the dialog. But it is not an ideal resource for reifying a meaning, which is not obvious to everyone.

In fact, several project groups demonstrated severe difficulties in using sub conferences for both participation and reification. E.g. the example below (Fig. 2) mirrors the collaboration of project group 1. They created several sub conferences, but they never used them.





4.  HumInfGruppeKonferencer:ProjektGruppe\_1 (0 new of 109)
5.  HumInfGruppeKonferencer:ProjektGruppe\_1:ProjektVejledning\_1 (0 new of 21)
6.  HumInfGruppeKonferencer:ProjektGruppe\_1:SparNord (0 new of 1)
7.  HumInfGruppeKonferencer:ProjektGruppe\_1:litteratur (0 new of 0)

Figure 2: The VP structured by means of conferences (were not used)

Many virtual learning environments reify meaning, but mainly as sequences of written text adapted to a dialogical structure. A virtual conference may mirror the negotiation process chronologically or sorted by several criteria as e.g. date, participants, thread, etc. But, as argued by Wenger (1998), although linguistic interaction is essential, it is only one of several aspects in the negotiating meaning. In principle, virtual learning environments have provided limited functionality and support for genuine group collaboration in terms of reification. In general, they provide good support for the involved participatory processes, but not necessarily for the reificative part of the learning process.

#### Reification but limited participation

The second example stems from a course in computer science from Ostfold University College in Norway. The subject was LAN (Local Area Network) and Intranet. It was an open and flexible course, which was attended by both local and remote students, in total 120 participants. The course was carried out without ordinary lectures, but was organized around the structure provided by the student VP. In the course the metaphor of a workbook was used (instead of the term "VP"), as we wanted to use the metaphor to indicate the expected work style (a book is supposed to be thoroughly prepared).

LAN and Intranet
Ostfold College

**CourseInfo**  
Description  
Course model  
Books  
Participants

**Workbok**

**Meeting place**

**FAQ**

**Accessories**  
Links

**Responsibles:**  
Trond Løvereide  
Hans Olav Bør  
Håkon Tolsby

Last review: 05-10-99

## Workbook

Below follows an overview of the structure of the workbook. It is divided into three parts, which in turn is divided into three themes. This provides a structure of what you are expected to deliver, but it is up to you to give the workbook its final shape and content.

### Part 0: Preparation

Read about the course model and what is expected from you as a student.

Describe your learning goals and you expectations for taking this course. This is the first chapter in you workbook.

Implement a draft of your workbook on www and post the URL to Håkon Tolsby.

### Part 1: LAN

Themes for the workbook	Study-resources
<b>Overview:</b> Present an survey of the technology of LAN  <b>Case:</b> Describe a case that you will use as an example for implementing a LAN  <b>Problem:</b> Choose a particular problem within LAN that you will discuss.	<ul style="list-style-type: none"> <li>Infrastructure of LAN</li> <li>TCP/IP</li> <li>LAN based on NT server</li> </ul>
<b>Lab-exercise:</b> Describe your experiences from the lab-exercise	<ul style="list-style-type: none"> <li>Preparations to the lab-exercise</li> <li>lab-exercise i LAN</li> </ul>

Figure 3: The VP structured as a workbook

The workbook was divided into four chapters, one preliminary and three main chapters covering different aspects of the subject matter. In the preliminary chapter, the student was supposed to describe his/her learning goals and motives for attending this course. The three main chapters covered important aspects of the subject matter. Each of them consisted of a set of themes, which structured the work of the student. Our experience from the course was that the workbook motivated the students to work in an experiential manner (Kolb 1983). They used the workbook as an artifact where they reified their understanding. They were continuously returning to the workbook as they got more insight and elaborated on the problems, and they created workbooks based on personal experiences and interests. They also browsed each other's workbook. They compared their own workbook with others. They borrowed ideas from each other, but they did not become engaged in each other projects. There were no real interaction or social participation. They were sharing experiences, but they were not contributing to a shared knowledge building experience. There were no common goals for sharing, no joint enterprises, no mutual engagements. In other words, there was no construction of a community of practice.

## Conclusion and Future Perspectives

In this paper we have argued for the need of tools, such as VP's, to support the processes of both reification and participation in the negotiation of meaning in distributed CSCL. This, however, appears not to be a simple task.

Participation and reification must be in such proportion and relation as to compensate for their respective shortcomings. When too much reliance is placed on one at the expenses of the other, the continuity of meaning is likely to become problematic in practice (Wenger 1998, p. 65)

Although VP has been developed as an individual tool for learning, we envision that the concept can be expanded to comprise also the idea of a "shared VP" (i.e. for a group). A shared experience consists of both individual and collaborative contributions, and by collecting them and making them visible and accessible for the community of the group, a *shared repertoire* for collaboration may be established. The shared VP includes collaborative constructions and collaborative reflections. A shared VP should not be viewed as a substitute for the individual VP. On the contrary, a shared portfolio is dependent on the personal engagement that the individual portfolio provides. You cannot share and you cannot collaborate without having something to contribute – and without reflecting on what you contribute. And in a digital environment you are not equipped for collaboration without a set of digital resources that can present your knowledge and experience. However individual portfolios have limited value to a learning community if they are not shared and used for collective reflection and development.

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